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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/812,347	03/30/2004	Fumihiko Higuchi	071469-0307558	2682
909	7590	01/11/2006	EXAMINER	
PILLSBURY WINTHROP SHAW PITTMAN, LLP P.O. BOX 10500 MCLEAN, VA 22102			CHEN, KIN CHAN	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 01/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/812,347

Applicant(s)

HIGUCHI ET AL

Examiner

Kin-Chan Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) 30 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>033004;062404</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1-29, drawn to a method, classified in class 438, subclass 706.
 - II. Claim 30, drawn to an apparatus, classified in class 156, subclass 345.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus as claimed can be used to practice another and materially different process such as vapor deposition process.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

2. During a telephone conversation with Jeffery Karceski on January 5, 2006 a provisional election was made with traverse to prosecute the invention of group I, claims 1-29. Affirmation of this election must be made by applicant in replying to this Office action. Claim 30 is withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Specification

Updating the status of related U.S. Applications on page 1 of the specification is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-26 and 29 are rejected under 35 U.S.C. 102(e) as being anticipated by Tomoyasu et al. (US 2004/0185583; hereinafter "Tomoyasu").

In a method for chemical oxide removal, Tomoyasu (abstract; ([0007], [0059],[0074], [0200]; Fig. 2) teaches that a chemical oxide removal process may be performed using a process recipe including setting an amount of a first reactant , a second reactant. Tomoyasu [0007, lines 4-5] teaches setting an amount of an inert gas in order to achieve the trim amount. Tomoyasu teaches that the feature may be chemically treated by exposing the substrate to the process recipe and substantially

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removing the trim amount from the feature. Tomoyasu teaches the claimed variable parameters (setting a pressure, setting a temperature of substrate, setting a time period, setting a temperature of the process). Tomoyasu teaches changing process chemical treatment gas flow rates (e.g., gas flow rates of HF, NH₃, or inert gas), Tomoyasu also teaches thermally treating the substrate and rinsing the substrate following the chemical treating.

As to dependent claims 11 and 21, see [0062].

As to dependent claim 22, Tomoyasu ([0007], [0074]) teaches adjusting the amount of inert gas (gas flow rate) in order to remove the desired amount of the chemical oxide, therefore, it is considered to read on claimed limitation.

As to dependent claims 23-26, Tomoyasu ([0007], [0074]) teaches adjusting the amount of inert gas (gas flow rate) in order to remove the desired amount of the chemical oxide. Tomoyasu teaches using charts, and various models for analysis, therefore, it includes using curve fitting and polynomial expressions to determine the relationship.

5. Claims 1, 4-8, 10, 11, and 29 are rejected under 35 U.S.C. 102(e) as being anticipated by Newton et al. (US 2004/0099377; hereinafter "Newton").

In a method for chemical oxide removal, Newton (abstract; ([0026], [0033], [0057], [0073], [0074])), teaches that a chemical oxide removal process may be performed using a process recipe including setting an amount of a first reactant, a second reactant. Newton teaches setting an amount of an inert gas in order to achieve

the trim amount. Newton teaches that the feature may be chemically treated by exposing the substrate to the process recipe and substantially removing the trim amount from the feature. Newton teaches the claimed variable parameters (setting a pressure, setting a temperature of substrate and setting a temperature of the process). Newton teaches changing process chemical treatment gas flow rates (e.g., gas flow rates of HF, NH₃, or inert gas).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tomoyasu et al. (US 2004/0185583; hereinafter "Tomoyasu").

In a method for chemical oxide removal, Tomoyasu (abstract; ([0007], [0059],[0074], [0200]; Fig. 2) teaches that a chemical oxide removal process may be performed using a process recipe including setting an amount of a first reactant , a second reactant. Tomoyasu [0007, lines 4-5] teaches setting an amount of an inert gas in order to achieve the trim amount. Tomoyasu teaches that the feature may be chemically treated by exposing the substrate to the process recipe and substantially removing the trim amount from the feature. Tomoyasu teaches the claimed variable

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parameters (setting a pressure, setting a temperature of substrate, setting a time period, setting a temperature of the process). Tomoyasu teaches changing flow rates of chemical treatment gases (e.g., gas flow rates of HF, NH₃, or inert gas). Tomoyasu also teaches thermally treating the substrate and rinsing the substrate following the chemical treating.

The instant claims differ from Tomoyasu by specifying using the curve fitting including multiple regimes and using separate mass flow controller. However, Tomoyasu teaches using flow controller for the process gas. Using one controller or multiple controllers for the process is merely a matter of choices of engineering depending on product requirement, in the absence of unexpected result, it would have been obvious to one with ordinary skill in the art to choose one or the other depending on the product requirement and quality criteria of the product.

8. Claims 12, 15-19, and 21-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Newton et al. (US 2004/0099377; hereinafter "Newton").

In a method for chemical oxide removal, Newton (abstract; ([0026], [0033], [0057], [0073],[0074])), teaches that a chemical oxide removal process may be performed using a process recipe including setting an amount of a first reactant , a second reactant. Newton teaches setting an amount of an inert gas in order to achieve the trim amount. Newton teaches that the feature may be chemically treated by exposing the substrate to the process recipe and substantially removing the trim amount from the feature. Newton teaches the claimed variable parameters (setting a pressure,

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setting a temperature of substrate and setting a temperature of the process). Newton teaches changing process chemical treatment gas flow rates (e.g., gas flow rates of HF, NH₃, or inert gas). As such, it would have been obvious to one with ordinary skill in the art to determine the relationship between a trim amount of the feature and an amount of an inert gas. The relationship may be established for an amount of first process gas, and an amount of first process gas. The trim amount may be achieved by using the relationship.

As to dependent claims 23-28, after gathering information of etching rates, thickness (trim amount), and process parameters, it would have been obvious to one with ordinary skill in the art to tabulate / extrapolate / manipulate data and perform calculation using common statistical methods (such as regression, extrapolation, best-fit, the harmonic of signal using multivariate analysis, polynomial, least squares, interpolation) and numerical analysis. Claims 27 and 28 differ from prior art by specifying using the curve fitting including multiple regimes and using separate mass flow controller. However, Newton teaches using flow controller for the process gas. Using one controller or multiple controllers for the process is merely a matter of choices of engineering depending on product requirement, in the absence of unexpected result, it would have been obvious to one with ordinary skill in the art to choose one or the other depending on the product requirement and quality criteria of the product.

9. Claims 1, 4-12, and 15-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natzle et al. (US 2004/0097047; hereinafter "Natzle") in view of Newton et al. (US 2004/0099377; hereinafter "Newton").

In a method for chemical oxide removal, Natzle ([0014], [0037],[0038], [0042]-[0044]) teaches that a chemical oxide removal process may be performed using a process recipe including setting an amount of a first process gas and an amount of a second process gas. Natzle [0042] teaches acquiring trim amount data as a function of variable parameters (such as temperature, composition, residence time, pressure of the process gas, the amount of reactant or the rate of process gas), **all of which can be regulated**. Natzle teaches that the feature may be chemically treated by exposing the substrate to the process recipe and substantially removing the trim amount from the feature. Natzle [0042] also discloses that the aforementioned variable parameters influence the amount removed.

The claimed invention differs from Natzle by specifying well-known feature of adding inert gas (argon) to the process gas. Newton ([0073][0074]) is only relied on to show this feature. Hence, It would have found it obvious to incorporate inert gas to same in order to provide more uniform and stable etching with a reasonable expectation of success. As such, the adjustment of variable parameters discussed in Natzle are applicable in the combined Natzle and Newton. Thus, it would have been obvious to one with ordinary skilled in the art to determine the relationship between a trim amount of the feature and an amount of an inert gas. The relationship may be established for an

amount of first process gas, and an amount of first process gas. The trim amount may be achieved by using the relationship.

As to dependent claim 11 and 21, see [0014].

As to dependent claims 23-28, after gathering information of etching rates, thickness (trim amount), and process parameters, it would have been obvious to one with ordinary skill in the art to tabulate / extrapolate / manipulate data and perform calculation using common statistical methods (such as regression, extrapolation, best-fit, the harmonic of signal using multivariate analysis, polynomial, least squares, interpolation) and numerical analysis. Claims 27 and 28 differ from prior art by specifying using the curve fitting including multiple regimes and using separate mass flow controller. However, prior art teaches using flow controller for the process gas. Using one controller or multiple controllers for the process is merely a matter of choices of engineering depending on product requirement, in the absence of unexpected result, it would have been obvious to one with ordinary skill in the art to choose one or the other depending on the product requirement and quality criteria of the product.

10. Claims 2, 3, 13, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Natzle and Newton as applied to claims 1 and 12 above, and further in view of Doris et al. (US 2004/0241981; hereinafter "Doris").

The discussion of modified Natzle and Newton from above is repeated here.

Natzle and Newton are silent about the heating and rinsing with water after the chemical treating. In a method for chemical oxide removing, Doris teaches heating and

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rinsing with water after the chemical treating so as to efficiently remove the solid reaction product, see [0046]. Hence, it would have been obvious to one with ordinary skill in the art to modify Natzle and Newton by heating and rinsing with water as taught by Doris in order to efficiently remove the solid reaction product.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (571) 272-1461. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

January 6, 2006



Kin-Chan Chen
Primary Examiner
Art Unit 1765

K-C C